D4.5.1 Enabler prototypes

WP4.5 - Development of the DIALOGUE applications
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WP 4.5 Development and Integration of the DIALOGUE Applications

SP4 Apps

**Collaborative ACC (C-ACC)**
- Harmonizing the cruising speed to impact on safety, fuel consumption, and CO2 emissions

**Eco-friendly parking (EFP)**
- Help find a car-park close to destination

**Collaborative driving and merging (CDM)**
- Improve safety and energy efficiency by advising the driver about speed, lane changes and roundabouts

**Collaborative Navigation (CONAV)**
- Collaborative eco-friendly navigation

**Serious Gaming and Community Building (SG-CB)**
- Improve the driving performance, in a pleasant and compelling way
(1) Overview of the applications
(2) **Overview of the enablers**
(3) Detail of the enablers
(4) Outlook of collaboration-related modules
SP4 Enablers

• Modules grouping sets of homogeneous functionalities designed to be used by different applications
• Mostly but non exclusively for SP4 apps
• Development adapted and prioritized according to the needs of the apps under development
D4.5.1 development of the SP4 enablers

SP4 Enablers

• Cross-SP
  • User registration
  • User data management
  • User authentication
  • Social networking (gaming)

• Used by several DIALOGUE apps
  • HMI proxy
  • HMI device provider

• Used by a single DIALOGUE app
  • Green light optimized speed advisor
  • Speed advisor
  • Lane access management
  • Driving safety performance assessment
  • Data ingestion
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Enablers used by a single DIALOGUE app

(1) Green light optimized speed advisor
(2) Speed advisor
(3) Lane access management
(4) Driving safety performance assessment
(5) Data ingestion
SP4 enablers

Green light optimized speed advisor

- Based on MAP and SPAT messages received from the roadside infrastructure and the current position of the vehicle, a speed advice is created

- Two levels of APIs in order to offer flexibility to the clients:
  - Calculated speed advice
    - Speed interval
    - Distance to intersection
    - Time to green
    - Direction
  - Object model of decoded ASN.1 messages
SP4 enablers

Green light optimized speed advisor – HMI example
Green light optimized speed advisor – status

- Ready for simulator tests
- Simulator tests remains to be done due to delays in simulator development
- Expected use by the SP4 CDM and C-ACC applications
- Expected use in the Gothenburg, Torino and Berlin test sites
SP4 enablers

Speed advisor

• Receives speed advice from multiple sources and determines current and upcoming effective speed advice
• The following information is created
  • Relative start distance of speed advice
  • Relative end distance of speed advice
  • Source of speed advice (GLOSA, map data, infrastructure)
  • The speed advice (including lowest speed, if source is GLOSA)
  • Direction in which the speed advice applies
SP4 enablers

Speed advisor – status

- Ready for simulator tests
- Depends on the GLOSA enabler for integration testing
- Expected use by the SP4 CDM and C-ACC applications
- Expected use in the Gothenburg, Torino and Berlin test sites
Lane access management

- Deals with the infrastructure of dedicated lanes, in the context of the SP3 Collaborative Dynamic Corridor application
- Receives MAP-messages from the infrastructure about availability of dedicated lanes.
- Provides an API for requesting access to dedicated lanes and receive results of the requests
- The request is evaluated by the infrastructure (SP3 CDC) based on the regulations set up by the road administrator
SP4 enablers

Lane access management – status

- Ready for integration testing, but depends on infrastructure developments in SP3 Collaborative Dynamic Corridors
- Expected use by the SP3 Collaborative Dynamic Corridor application
- Expected use in the Gothenburg and Torino test sites
SP4 enablers

Driver performance assessment

- VDP vehicular signals processed
- Three evaluation algorithms developed:
  - Thresholding, k-nearest neighbours (supervised machine learning), Kohonen neural network (unsupervised learning)
- Instantaneous user feedback
  - Thresholding and k-nn
- Batch processing (about 1 min. windows)
  - Kohonen
- Sensor fusion of different parallel evaluators for an overall assessment
SP4 enablers

Driver performance assessment – status

- Tested on the basis of one Volvo truck recording and other synthetic data
- Extensive testing and consequent tuning is needed
  - Recordings are being collected in the Trento test site
  - Other recordings are needed from the other candidate test sites
- Work in progress
  - Integration of traffic and meteo data and speeding behaviour (when speed limit data is available)
- Expected use by the SG app
SP4 enablers

Data ingestion service

• Enable receiving, validating and recording contents generated by a community of users about mobility issues/conditions
  • (i.e. dangers, queues, car-parks, works ....)
• Validation is related to social-like applications: «confirmation carried out by the community about an information generated by a user»
• CSEs support a user community by changing the reputation of individual members through a proprietary validation mechanism
• Classification of community members in terms of their contribution to the community
  • A user reputation is increased or decreased on the basis of the number of confirmations / denials collected by his event notification
SP4 enablers

Data ingestion service – status

• Release & deployment of version 1.0 of Data Ingestion Service
• Release & deployment of Data Ingestion Service EFP customized features
• Tested in lab and in the field testing in the Turin integration test week
• Design of the Reputation evaluation algorithm customized for the EFP app
  • Customizations may be done for other apps on demand
Enablers used by several DIALOGUE apps

(1) HMI device provider
(2) HMI proxy
SP4 enablers

HMI device provider

- Software module managing the Human-Machine Interaction on Android personal devices
- Presentation jobs are received from the HMI-Proxy enabler through a TCP Socket connection and decoded from XML for the actual presentation
- User feedback is encoded to JSON and sent to the HMI-Proxy
SP4 enablers

HMI device provider – status

• Planned to be used by several DIALOGUE apps in all the test sites
• General architecture, background services and connection to the HMI Proxy is implemented on Android
• GUI under development on the basis of the design mockups upcoming from the HMI group
SP4 enablers

HMI proxy

- The HMI-Proxy acts as a proxy for the applications to interact with the HMI
- The HMI_Proxy offers several OSGi services usable by the applications to inform the driver or get driver’s feedback
  - Java APIs
- Presentation jobs are encoded to XML and sent to the HMI Device provider
- User feedback coming from the HMI device provider is decoded and handed over to relevant applications through Java API
SP4 enablers

HMI proxy – status

• Planned to be used by several DIALOGUE apps in all the test sites
• General Architecture implemented
• OSGi impl Bundle available
• OSGi API (necessary for implementing the apps’ user interaction) under development on the basis of the HMI concept (upcoming from the HMI group)
Cross-SP enablers

(1) User registration
(2) User data management
(3) User authentication
(4) Social networking (gaming)
Identity management

• Unique user identity management across all the TEAM apps
  • FLEX and DIALOGUE

• Includes three enablers
  • User registration
  • User authentication
  • User data management

• Implemented as webservice in the cloud
SP4 enablers

Identity management – Registration and user data management

- User creation
  - The TI CSE platform assigns a non modifiable OpenID URL
- Account management
  - Change password (user name is unique)
  - Un-register
- User profile management
  - Accessible by apps through the provided OpenID URL
  - App-specific profile customizations are possible

- http://its.tilab.com/IdentityManager
Identity management – Authentication

- Verification of claims about specific user identities
- The OpenID URL can be used by any TEAM application
  - OpenID 2.0 protocol for federated authentication
- Same access allowed also through credentials (username and password)
  - http://its.tilab.com/IdentityAccess/OpenId
- A REST-ful interface to the identity management server is also implemented for programmatic access
  - https://its.tilab.com/IdentityManager/authenticate/user
Identity management – status

- Release & deployment of version 1.0 of User Registration functionality
- Rel. & dep. of version 1.0 of OpenID Authentication functionality
- Rel. & dep. of version 1.0 of REST Service Authentication functionality
- Rel. & dep. of version 1.0 and 1.1 of User Data Management functionality
- Field tested in the Turin Integration test week and within an SG-CB app prototype
- Cloud service usable by any app in any test site
SP4 enablers

Social networking for vehicles

- Focus on the innovative aspects of social gaming
- Separation of performance (Virtual Coins) and comparison (Competition)

- Virtuous cycle for acquiring (good performance) and spending VCs
- Periodic competitions in different areas, in different time frames
  - Self and social performance comparison and ranking
  - Usable by all TEAM apps (combined results)
- Badges
- Friendship and groups
- Service oriented architecture (REST web services in the cloud)
SP4 enablers - Demos

Social gaming prototype chain deployed (sample snapshot from the SG app)

- Recorded vehicle input for lab tests
- VDP
  - VDP consumer
  - Driver Performance Assessment
- Evaluators
  - Kohonen Neural Networks
  - k-nearest neighbor
  - Thresholding
- VIS – Vehicle ITS Station
- CIS – Backend
- Virtual Coins Server
- Competition Server

D4.5.1 DIALOGUE Enablers – WP4.5
Social networking for vehicles - status

- Release v1.0 available on the cloud
- Integration tests ongoing
- Interactions needed for organization of the test sites
  - Virtual coins expenditure
  - Competition apps, areas and timeframes
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SP4 enablers

TEAM collaborative modules outlook (I)

- Virtual Coins
  - Virtual bank for accumulating and spending coins
  - Cloud service usable by all TEAM apps (aggregated)
  - Game features (e.g., happy hours, bonuses, saturation)
  - Possible real-world rewards

- Competition Manager
  - Self and social comparisons (time and space-based)
  - Cloud service usable by all TEAM apps (can be aggregated in competitions)
  - Game features (Charts, performance meters, badges)
  - Feeds to the VC server
SP4 enablers

TEAM collaborative modules outlook (II)

- Driver performance assessment
  - SG Green drive / fluid driving (different algorithms, with sensor fusion)
  - Metrics defined for an objective assessment of the user/driver
  - Similar metrics in several TEAM apps
  - Feeds to the VC server and to the Competition manager

- Reputation Management
  - Part of SP4 Data Ingestion enabler
  - Cloud service usable by all TEAM apps
  - Subjective assessment (peer assessment of information provided)
  - Currently implemented for EFP. May be customized to other apps
  - Feeds to the VC server may be implemented
SP4 enablers

TEAM collaborative modules outlook (III)

- Traveler Profile and Trip Monitoring (SP2 TLPM component)
  - User preferences and profile storage
  - Information about trip data
  - Usable by different apps

- Local Dynamic Map++ (SP2 LDM++ component)
  - Storage and retrieval of dynamic information from different vehicles
  - Usable by different apps for collaboration-based suggestions (e.g. speed)
Thank you!

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